Fig. 13. *Cellepora incrassata*, Sm. Vicarious mandible, × 85. From same specimen as figs. 11 & 12.
14. Do. Lateral oral mandible, × 85. From near Wilczek Land.
15. *Cellepora pumicosa*, Busk. Mandible, × 85. Lat. 77° 55′ N., long. 55° 25′ E.
16. Do. Operculum, × 85.
17. *Smittia ventricosa* (Hass.), var., × 25. Off glacier between Cape Flora and Cape Gertrude.
18. *Smittia Jacksonii*, nom. nov. Mandible, × 85. Lat. 77° 55′ N., long. 55° 25′ E.
Figs. 19, 20. *Smittia lamellosa* (Sm.). Operculum and mandible. × 85.
Fig. 21. Do. Do. × 25.
22. *Porella obesa*, sp. nov. Mandible, × 250.
23. Do. Operculum, × 85.
24. Do., × 25. Off Elmwood.

Observations on *Syllis vivipara*, Krohn.

By Edwin S. Goodrich, M.A., F.L.S.

[Read 7th June, 1900.]

(Plate 13.)

Whilst working last winter at the Zoological Station in Naples, I found in the tank of the large laboratory an interesting small Syllid, which I believe to be the *Syllis vivipara* originally named by Krohn in 1869 (2).

Since Krohn gave but a very brief description of his worm, without figures, merely stating that in general structure it closely resembles Claparède's *Syllis Armandi* (probably *S. prolifera*, Krohn), it is by no means easy to make certain whether we are really dealing with his species. The worm reaches to a length of 2 cm., and appears pale yellow in colour owing to the intestine, which is seen through the transparent and almost colourless body-wall (Pl. 13. fig. 1). The palps are joined together below the prostomium for about half their length (figs. 1 & 2). The dorsal cirri are of considerable length, especially in the anterior region (fig. 1). As Krohn mentions, the terminal joint of the chætæ are provided with a single hook (fig. 6).

Internally, the alimentary canal is of quite normal structure. The pharynx possesses a single tooth, and nine papillæ at its anterior end (figs. 1 & 3).

It is with regard to its method of reproduction that this Syllid is of peculiar interest. In all the specimens I examined (about twenty) either ova, or embryos in various stages of development were found in the cœlomic cavity of the posterior region. Krohn briefly described this viviparous reproduction, and stated that the embryos grow within the body-cavity of the parent to an advanced stage, when they completely resemble the adult excepting in their smaller size and lesser number of segments. According to this observer, they then escape by the breaking-off of the hinder region of the parent's body.

Ehlers, in his large work on the Polychæta (1), gives an account of Krohn's observations, and suggests that fertilization must take place by way of the nephridia. Since Krohn's note, published more than 30 years ago, no confirmatory evidence has been given of viviparity in any Syllid, excepting for the mere mention of a case (*Syllis incisa*) by Levinsen (3). Malaquin, in fact, in his monograph of these Polychæta (4), throws doubt on the accuracy of the observations recorded by these authors.

The figures herewith given will, I hope, place beyond doubt that we have here a truly viviparous Syllid.

In *Syllis vivipara* the ova are produced only in the posterior third of the body, where they are shed into the cœlom in comparatively small numbers. Here they undergo development from before backwards, and as many as eighteen embryos may be found in one parent. The course of development seems to differ in no marked way from that pursued by other Syllids outside the mother. Malaquin's figures of the stages in the ontogeny of *Eusyllis monilicornis* (4) would apply almost equally well to *Syllis vivipara*. As the embryos grow larger they have some difficulty in accommodating themselves within the parental body-cavity. They usually take up a longitudinal position, with their head directed backward, and extend along many segments through the incomplete septa. In fig. 1 (Pl. 13) is shown a worm the young of which must be almost ready to escape. They have fully acquired the parent's form, differing from it only in size. The cilia in the rectum can be seen to work from behind forwards, as in the adult.

We are naturally led to enquire how these embryos are nourished, and how the ova from which they have developed were fertilized.

With regard to the first question, there can be no doubt what-

ever that the yolk stored in the egg is not enough to provide nourishment sufficient for the growth of the embryos to the large size they attain in the body-cavity of the parent. Further food-material the young must derive from the mother during development; and, since there is no special connection of tissues between the two, this food would appear to be taken in either by mere diffusion through the general surface of the body, or by the mouth or anus. In some such way the embryos must obtain nourishment from the cœlomic fluid of the mother.

The second question is less easy to answer. In the first place, since all the specimens I found contained ova, it is just possible that we have here a case of parthenogenetic development*. Should, however, spermatozoa actually at some time penetrate to the cœlom and fertilize the ova, it is by no means easy to see how such a process could take place. The surface of the body is covered with a cuticle, and it is not likely that the spermatozoa reach the cœlom by entering the alimentary canal and boring their way through its wall. The only other means of access would appear to be the nephridia. Now these organs, so far as I have seen, do not undergo any of those changes in size and structure at maturity, such as are known to take place in many allied forms. The nephridia are delicate tubes, with a very narrow lumen, opening internally by a small nephrostome, and externally by a minute pore. The cilia of the nephrostome and of the canal act in such a way as to force substances down the canal to the exterior. That spermatozoa struggle up this narrow and difficult path is hard to believe.

One possibility remains to be considered, though it must be admitted to be a somewhat improbable one—namely, that it is a case of self-impregnating hermaphroditism. A few viviparous hermaphrodite Polychætes are known, such as *Nereis diversicolor*, *Salmacina Dysteri*, and *Pomatoceros triqueter*; and it has been suggested by Schröder for the first species (7), and by de Saint-Joseph for the two last (6), that in these worms self-impregnation occurs.

The evidence of hermaphroditism in *Syllis vivipara* is by no means convincing. In sections of the hinder segments, whilst

* MM. Mesnil and Caullery have already suggested that in one viviparous form of the Cirratulid *Dodecaceria concharum* the development of the ova is parthenogenetic (5).

ova can be seen loose in the body-cavity, the segmental gonads have in places very much the appearance of testes, the cells at the periphery being numerous and small; but I have never found ripe spermatozoa, and the point remains doubtful. It is in the hope of inducing some observer to settle this interesting question, that I publish the foregoing observations.

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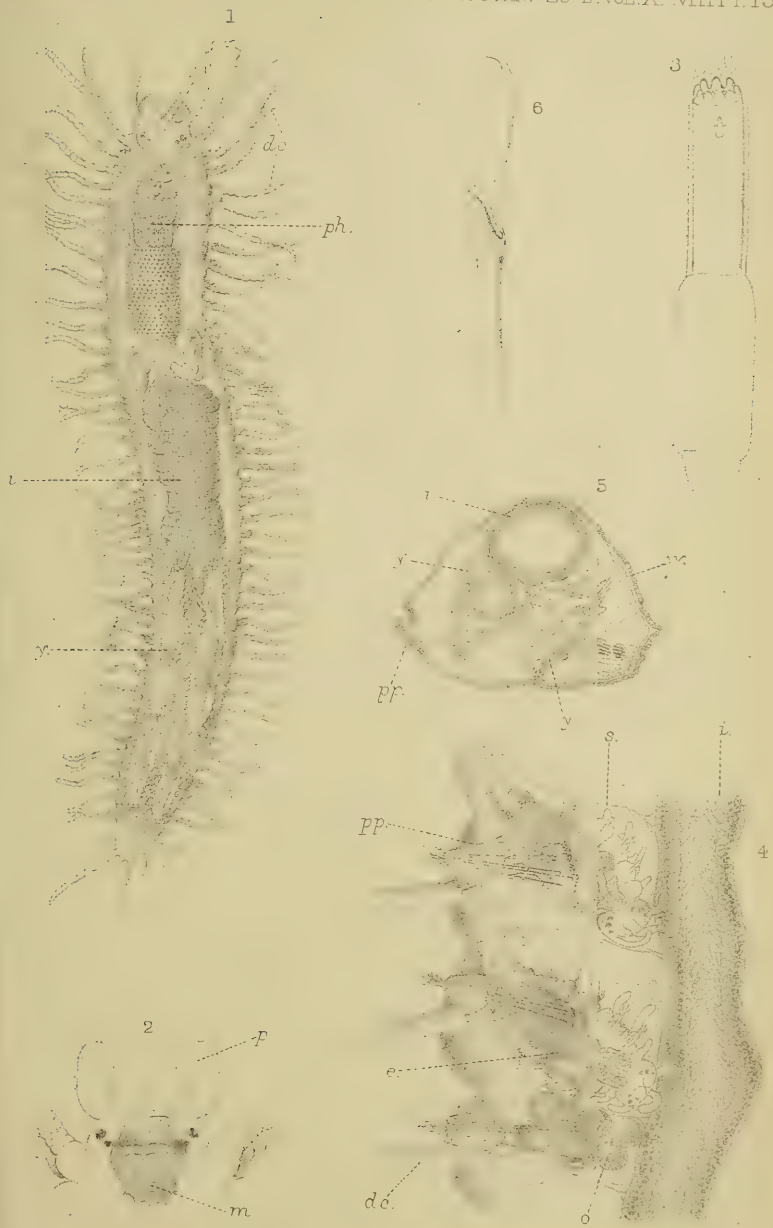
EXPLANATION OF PLATE 13.

(All the figures are of *Syllis vivipara*, Krohn.)

Fig. 1. Enlarged dorsal view of an adult specimen containing several well-developed young. *d.c.*, dorsal cirri; *ph.*, pharynx; *i.*, intestine; *y.*, young.
2. Ventral view of the head, showing the mouth (*m.*) and palps (*p.*).
3. Sketch of the pharynx in the extended condition.
4. Ventral view of a portion of three posterior segments containing ova and developing embryos. *pp.*, parapodium; *s.*, septum; *i.*, intestine; *e.*, embryo; *d.c.*, dorsal cirri; *o.*, ovum.
5. Transverse section of an adult worm, showing two embryos in the cœlom. *w.*, body-wall; *i.*, intestine; *pp.*, parapodium; *y. y.*, young.
6. Distal end of a chæta.



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REPRODUCTION OF SYLLIS VIVIPARA.